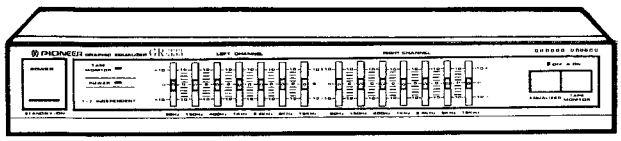
PIONEER®
The future of sound and vision.

GR-333

GRAPHIC EQUALIZER
EGALISEUR GRAPHIQUE
GRAPHISCHER ENTZERRER
EQUALIZZATORE GRAFICO
GRAFISCHE EQUALIZER
GRAFISK EQUALIZER
ECUALIZADOR GRÁFICO
IGUALADOR GRÁFICO



Operating Instructions
Mode d'emploi
Bedienungsanleitung
Istruzioni per l'uso
Gebruiksaanwijzing
Bruksanvisning
Manual de instrucciones
Manual de instruções

English
Français
Deutsch
Italiano
Nederlands
Svenska
Español
Português

IMPORTANT

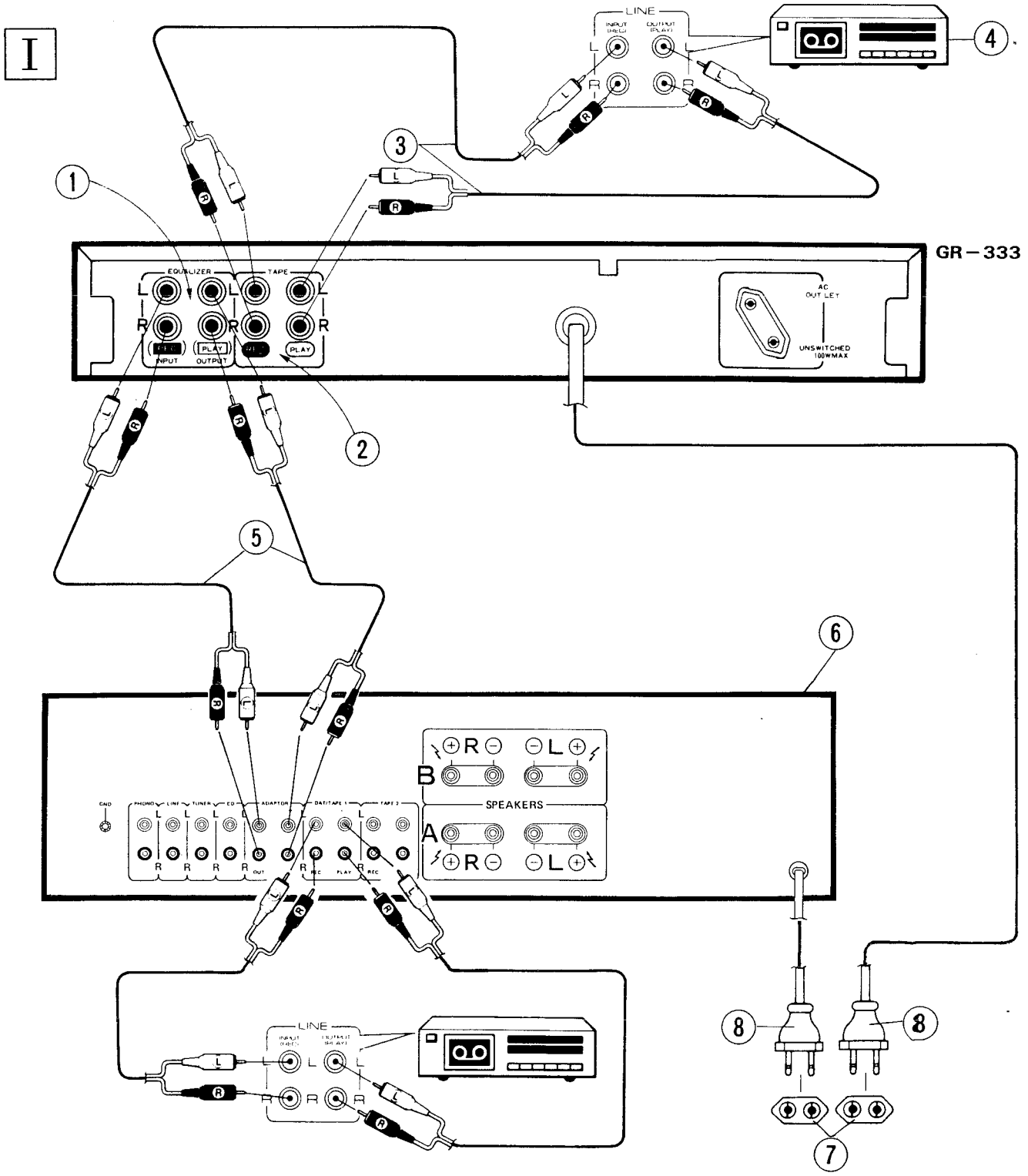
The lightning flash with arrowhead, within an equilateral triangle, is intended to alert the user of the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN

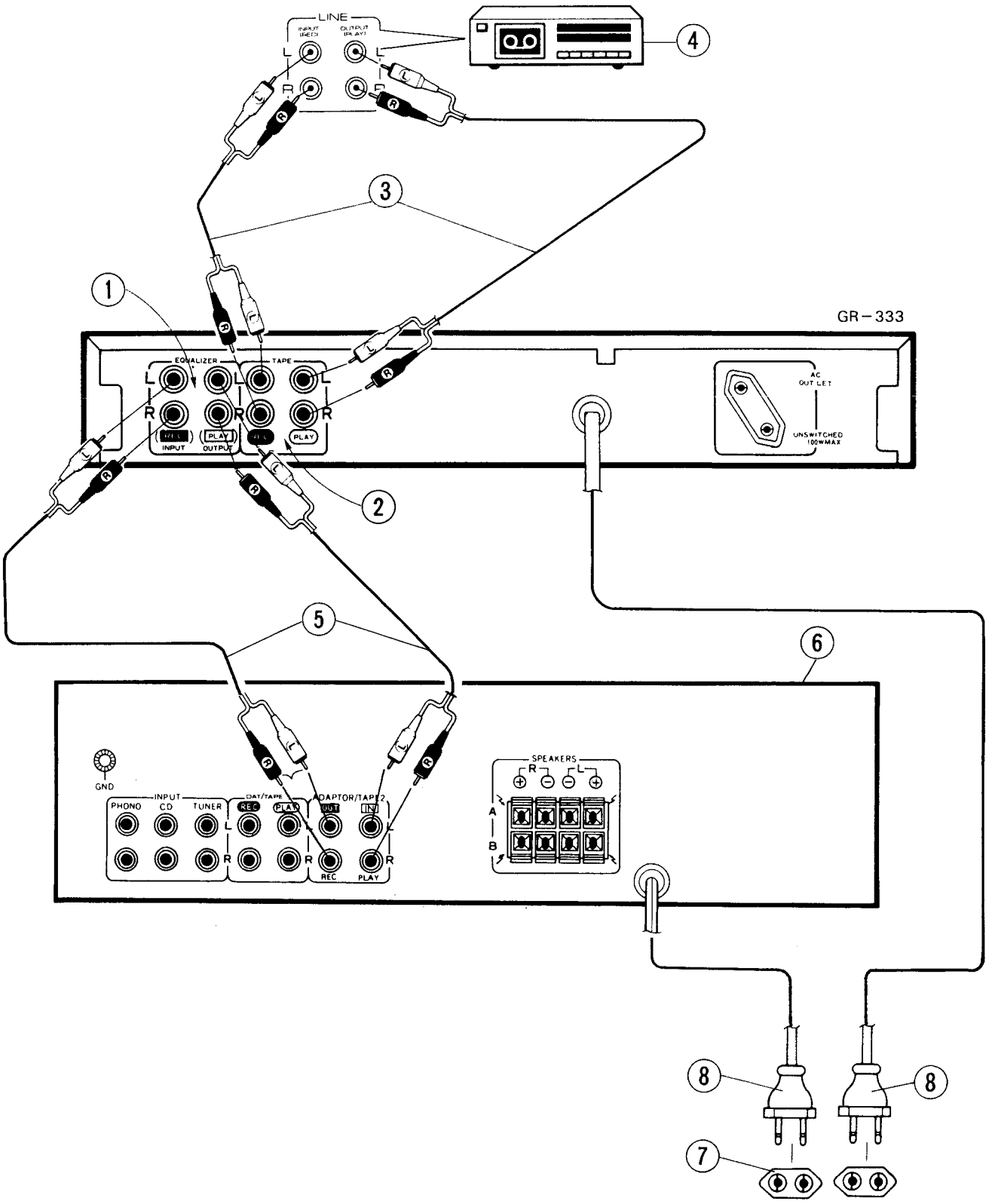
CAUTION:
TO PREVENT THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

The exclamation point within an equilateral triangle is intended to alert the user of the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

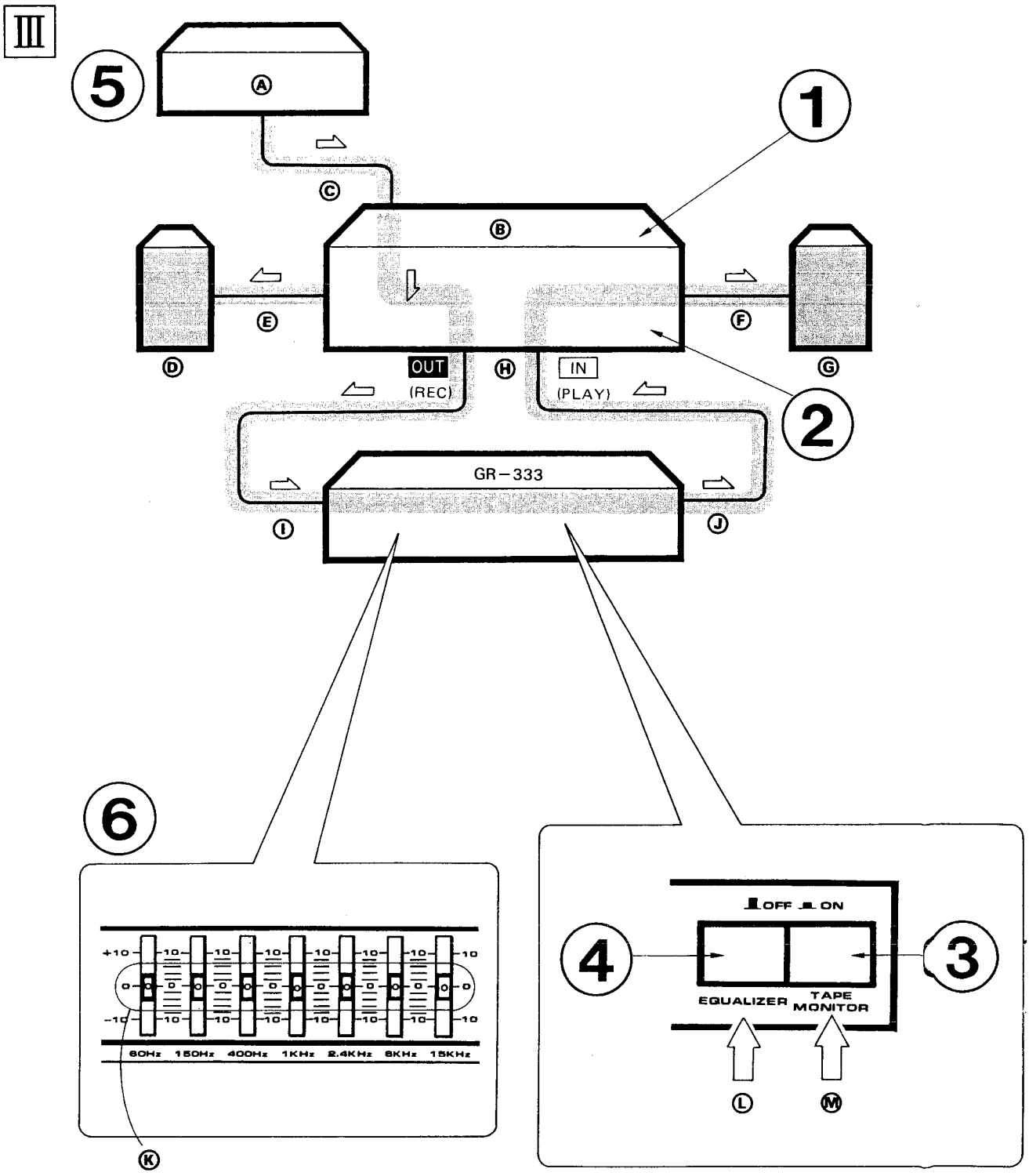
- For the explanation of Nos. (① –) in the figure, please see section "CONNECTION Ⅰ, Ⅱ".
- Pour l'explication des N° (① –) contenus dans la figure, prière de voir la section "CONNEXION Ⅰ, Ⅱ".
- Für die Erklärung der Nummern (① –) in der Abbildung nehmen sie bitte auf den Abschnitt "ANSCHLUSSE Ⅰ, Ⅱ" Bezug.
- Per le spiegazioni a riquardo dei No. (① –) nella figura, vedi la sezione "COLLEGAMENTI Ⅰ, Ⅱ"
- Zie het hoofdstuk "AANSLUITINGEN Ⅰ Ⅱ" voor de verklaring van de in de afbeelding gebruikte nummers (① –).
- Se avsnittet "ANSLUTNINGAR Ⅰ Ⅱ" för en förklaring av siffrorna (① –) på bilden.
- Con respecto a la explicación sobre los números (① –) de la figura, consulte la sección "CONEXIONES Ⅰ Ⅱ".
- Com relação à explicação dos números (① –) na ilustração, favor referir-se à secção sobre "CONEXÕES Ⅰ e Ⅱ".



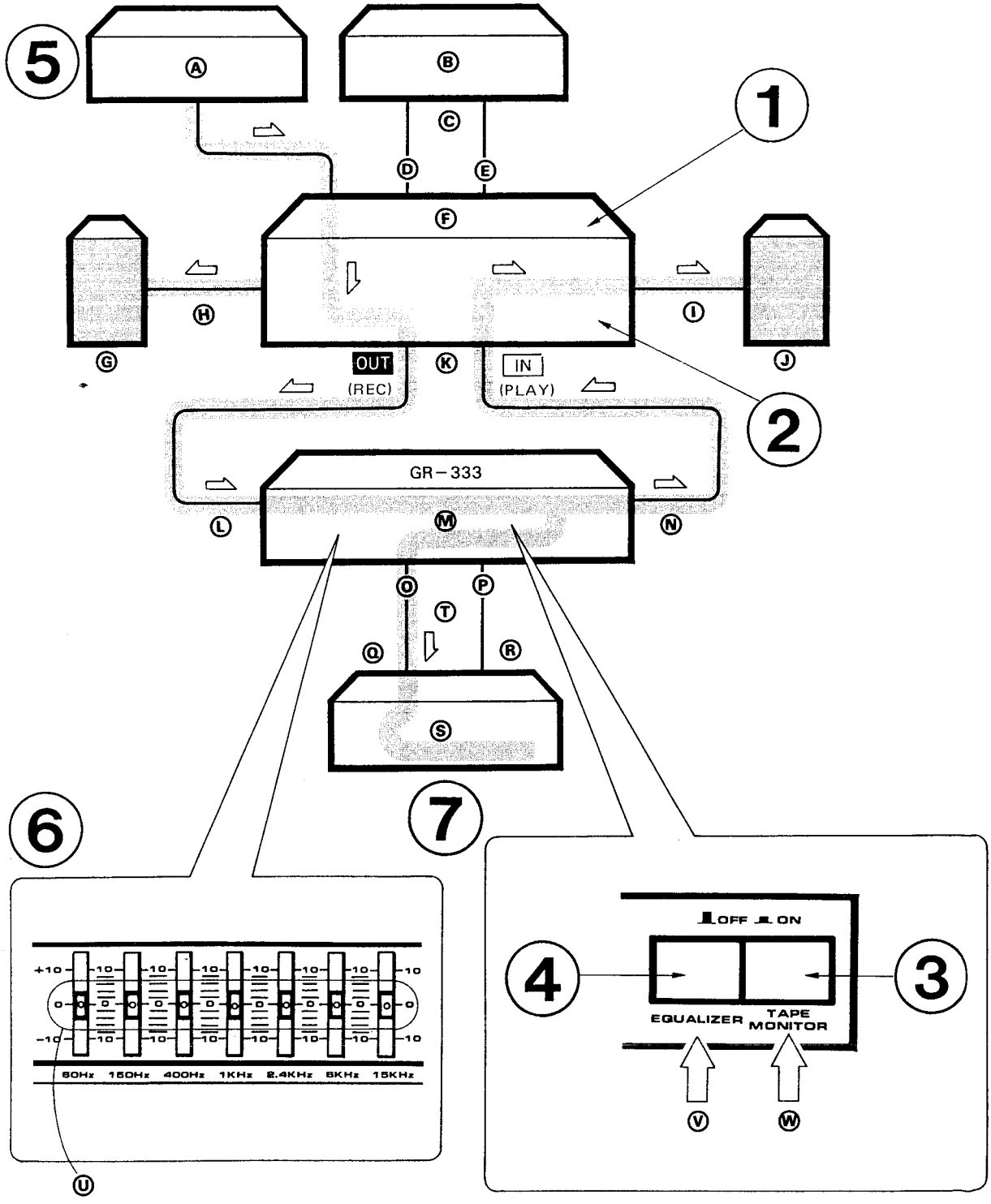
Ⅱ


LINE
4
3
1
GR-333
EQUALIZER
TAPE
INPUT
OUTPUT
REC
PLAY
AC OUT LET
UNSWITCHED 100W MAX
2
5
6
GND
INPUT
PHONO
CD
TUNER
DAT/TAPE
REC
PLAY
ADAPTOR/TAPE 2
OUT
IN
REC
PLAY
SPEAKERS
R
L
A
B
8
8
7

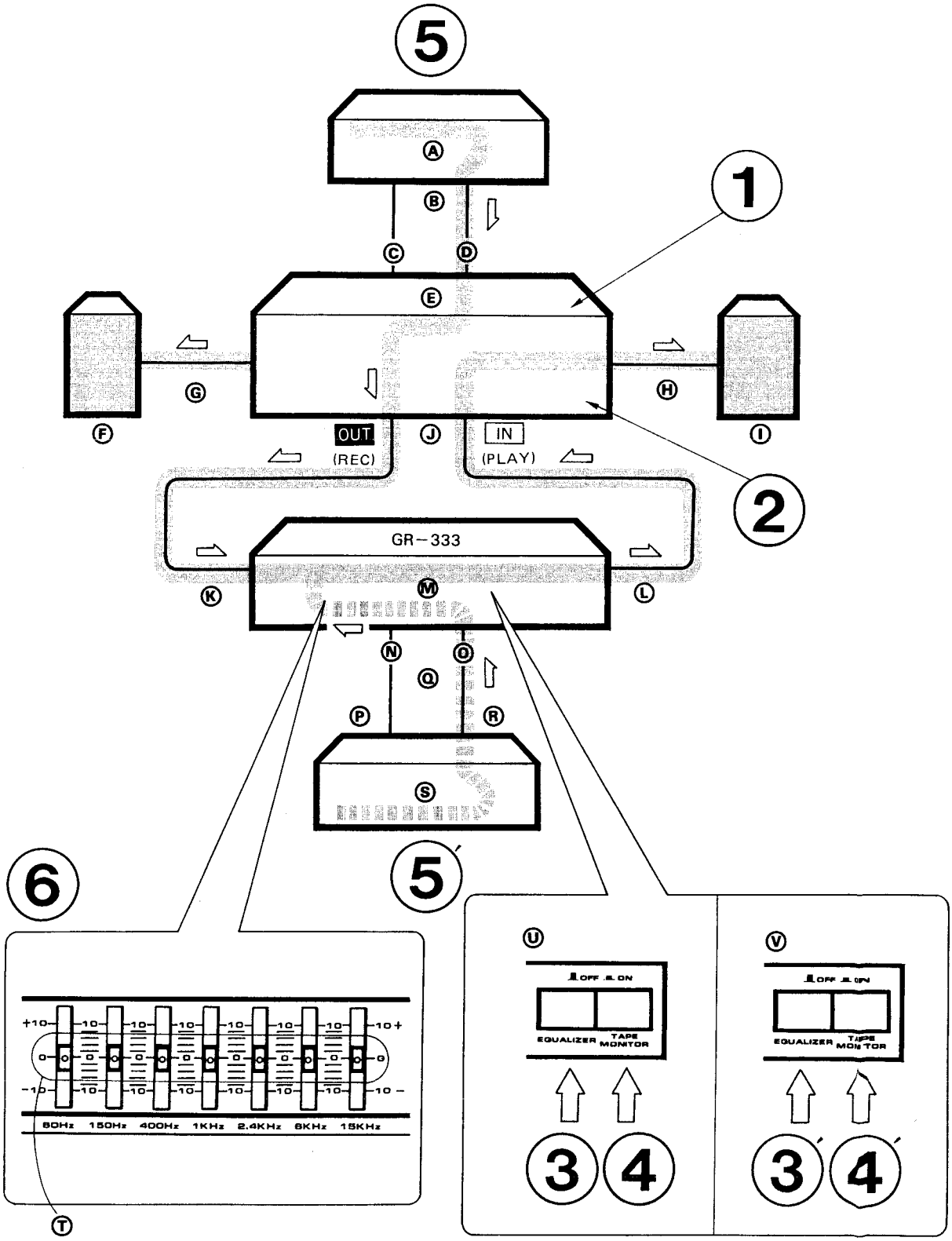
- For the explanation of Nos. (① –) in and letters (Ⓐ –) in the figure, please see section "OPERATIONS".
- Pour l'explication des N° (① –) et des lettres (Ⓐ –) contenus dans la figure, prière de voir la section "UTILISATION"
- Für die Erklärung der Nummern (① –) sowie Buchstaben (Ⓐ –) in der Abbildung nehmen Sie bitte auf den Abschnitt "BEDIENUNG" Bezug.
- Per le spiegazioni a riquardo dei No. (① –) e delle lettere (Ⓐ –) nella figura, vedi la sezione "FUNZIONAMENTO".
- Zie het hoofdstuk "BEDIENING" voor de verklaring van de in de afbeelding gebruikte nummers (① –) en letters (Ⓐ –).
- Se avsnittet "ANVÄNDNING" för en förklaring av siffrorna (① –) och bokstäverna (Ⓐ –) på bilden.
- Con respecto a la explicación sobre los números (① –) y las letras (Ⓐ –) de la figura, consulte la sección "OPERACIONES".
- Com relação à explicação dos números (① –) e letras (Ⓐ –) na ilustração, favor referir-se à secção sobre "OPERAÇÕES".



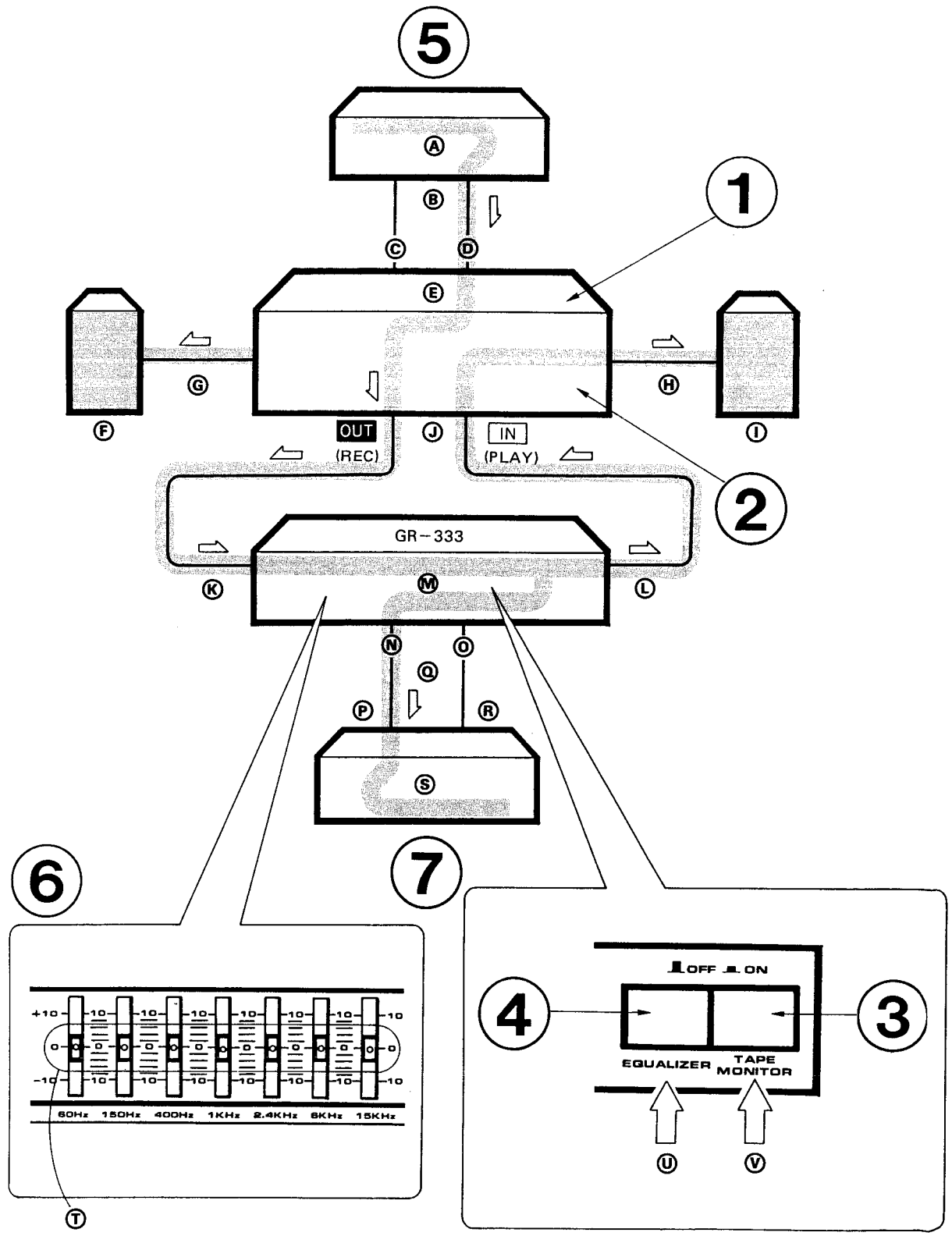
Ⅳ


5
A
B
C
D
E
1
F
G
H
I
J
OUT
(REC)
K
IN
(PLAY)
2
GR-333
L
M
N
O
P
T
Q
R
S
6
7
+10
0
-10
60Hz 150Hz 400Hz 1KHz 2.4KHz 6KHz 15KHz
U
OFF ON
4
3
EQUALIZER
TAPE MONITOR
V
W

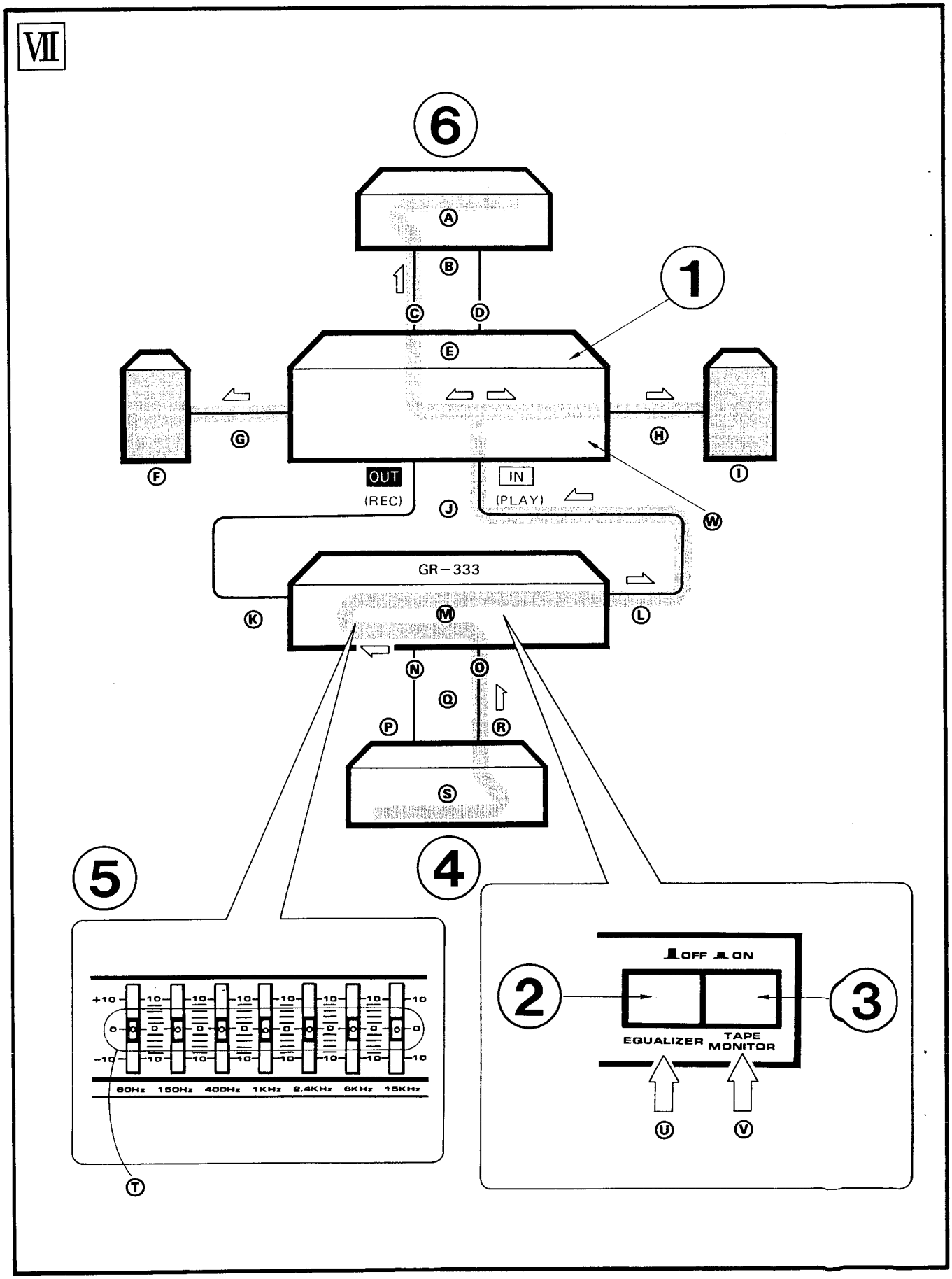
V


5
A
B
C
D
1
E
F
G
H
I
OUT
(REC)
J
IN
(PLAY)
2
GR-333
K
M
L
N
O
Q
P
R
S
6
5
+10
0
-10
80Hz 150Hz 400Hz 1KHz 2.4KHz 8KHz 15KHz
T
U
EQUALIZER
TAPE MONITOR
3
4
V
EQUALIZER
TAPE MONITOR
3
4

VI


5
A
B
C
D
1
E
F
G
H
I
OUT
(REC)
J
IN
(PLAY)
2
GR-333
K
M
L
N
O
Q
P
R
S
6
7
+10
0
-10
60Hz
150Hz
400Hz
1KHz
2.4KHz
6KHz
15KHz
T
OFF
ON
4
3
EQUALIZER
TAPE
MONITOR
U
V

VII


6
A
B
C
D
1
E
F
G
H
I
OUT
(REC)
IN
(PLAY)
J
W
GR-333
K
M
L
N
O
Q
P
R
S
5
4
+10
0
-10
60Hz
150Hz
400Hz
1KHz
2.4KHz
6KHz
15KHz
T
OFF
ON
2
3
EQUALIZER
TAPE MONITOR
U
V

Thank you for buying this Pioneer product.
Please read through these operating instructions so you will know how to operate your model properly. After you have finished reading the instructions, put them away in a safe place for future reference.
In some countries or regions, the shape of the power plug and power outlet may sometimes differ from that shown in the explanatory drawings. However, the method of connecting and operating the unit is the same.

CONTENTS

Connection I 9
Connection II 9
Functioning of Switches 9
Rear Panel Facilities 10
Front Panel Facilities 11
Using the Equalizer Controls 12
Operations 13
When Playing Records 13
When Recording Broadcasts 14
When Playing Back Tapes 14
When Editing Tapes 15
Troubleshooting 16
Specifications 16

CONNECTION I

(When amplifier has ADAPTOR jacks.)

[Refer to figure on page 2]

When connecting components, be sure that all power switches are OFF.
This is an example of the connections made when using the GR-333 in conjunction with PIONEER's components. For details, consult the Operating Instructions of the respective components.

① EQUALIZER jacks
② TAPE jacks
③ Accessory cord provided with the tape deck
④ Tape deck (Tape deck 2)
⑤ Accessory cord provided with GR-333
⑥ Stereo amplifier
⑦ AC wall socket
⑧ Power plug

CONNECTION II

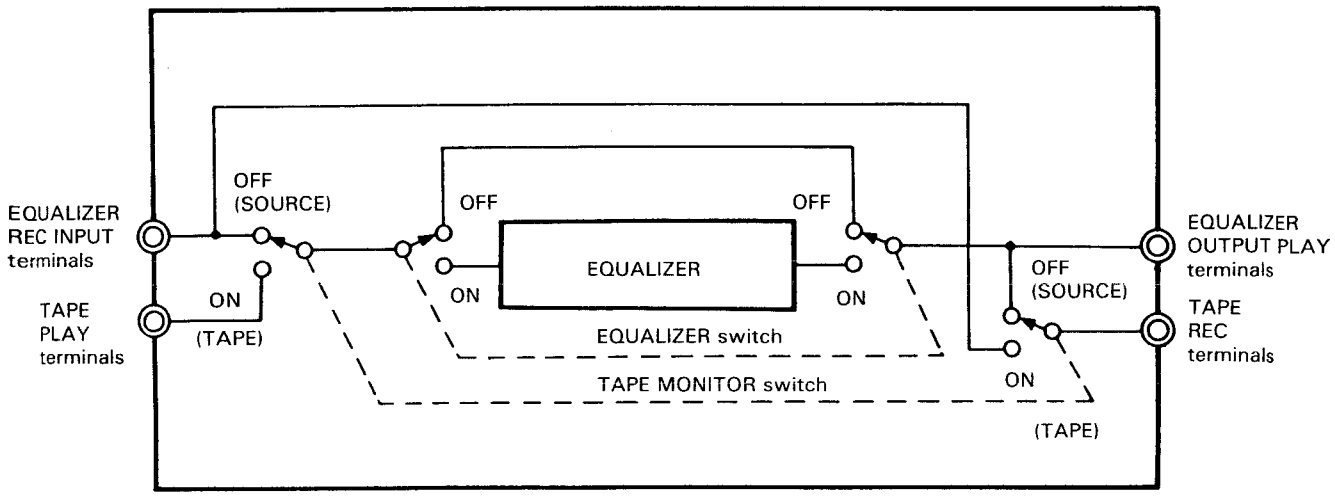
(When amplifier has ADAPTOR/TAPE 2 jacks.)

[Refer to figure on page 3]

When connecting components, be sure that all power switches are OFF.
For details, consult the Operating Instructions for the components to be connected.

① EQUALIZER jacks
② TAPE jacks
③ Accessory cords provided with the tape deck
④ Tape deck (Tape deck 2)
⑤ Accessory cord provided with GR-333
⑥ Stereo amplifier
⑦ AC wall socket
⑧ Power plug

FUNCTIONING OF SWITCHES



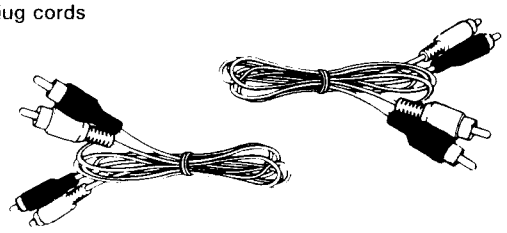
Above diagram shows L channel only.

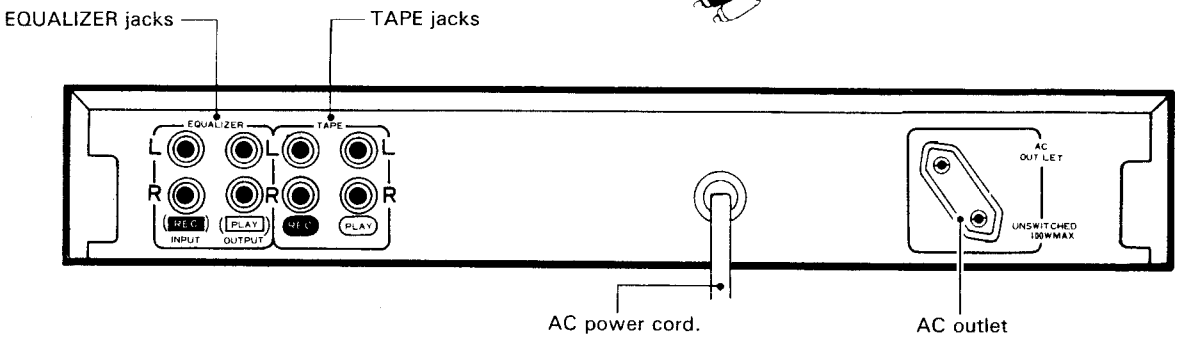
<ARE1089>

REAR PANEL FACILITIES

Two pin-plug cords are included as accessories. These are used to connect the graphic equalizer to your stereo amplifier. The white plug is for the left channel, and the red plug is for the right channel.

Pin-plug cords





EQUALIZER jacks

Connect to stereo amplifier. If your stereo amplifier has only one set of tape jacks, connect them to the graphic equalizer's INPUT and OUTPUT terminals.

TAPE jacks

If your stereo amplifier has only one set of tape jacks, connect them to your tape deck. If your amplifier has two sets of tape jacks (Tape 1, Tape 2), a second tape deck may be connected to the graphic equalizer's tape jacks.

AC OUTLET (UNSWITCHED 100 W MAX)

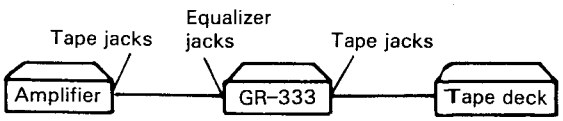
Power flows continually to this outlet, regardless of whether the equalizer is switched ON or STANDBY. Electrical power consumption of the connected equipment should not exceed 100 W. The equalizer should be disconnected by removing the mains plug from the AC wall socket when not in regular use, e.g. when on vacation.

NOTE:
Do not connect appliances with high power consumption such as heaters, irons, or television sets to the AC OUTLET in order to avoid overheating or fire risk.
This can cause the equalizer to malfunction.

STEREO AMPLIFIER TAPE JACKS

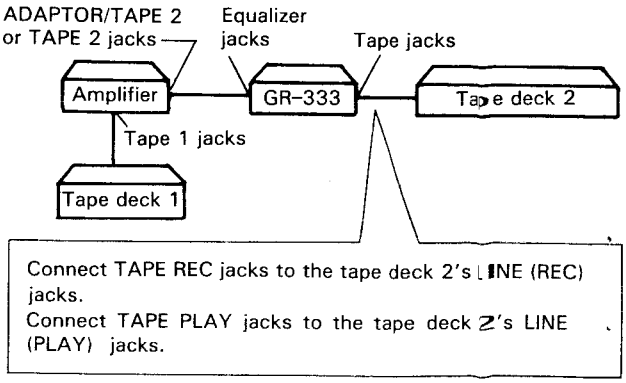
When the stereo amplifier has one set of tape jacks:

Connect the INPUT jacks to the stereo amplifier's TAPE REC jacks, and connect OUTPUT jacks to the stereo amplifier's TAPE PLAY jacks.

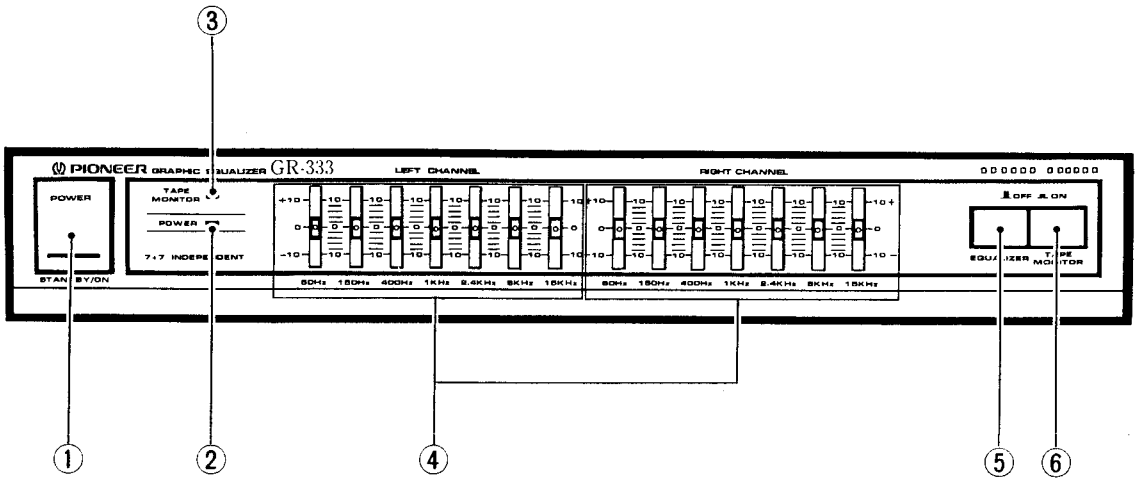


When the stereo amplifier has two sets of tape jacks:

Connect the INPUT jacks to the stereo amplifier's ADAPTOR/TAPE 2 or TAPE 2 [REC] jacks, and connect OUTPUT jacks to the stereo amplifier's ADAPTOR/TAPE 2 or TAPE 2 [PLAY] jacks.


ADAPTOR/TAPE 2 or TAPE 2 jacks
Equalizer jacks
Tape jacks
Amplifier
GR-333
Tape deck 2
Tape 1 jacks
Tape deck 1
Connect TAPE REC jacks to the tape deck 2's LINE (REC) jacks.
Connect TAPE PLAY jacks to the tape deck 2's LINE (PLAY) jacks.

FRONT PANEL FACILITIES



① POWER Switch (POWER STANDBY/ON)

When this switch is set to the ON position, power is supplied to the unit's main circuits (POWER indicator light.) The unit's power switch is geared to selecting the transformer's secondary and so even at the STANDBY position, the unit's circuitry will work as long as the power cord is connected to the AC power outlet.

Disconnect the power cord from the AC power outlet when you do not plan to use the unit for a long period of time.

NOTE:
Even when performing playback without using the functions of this componets, be that its power switch is ON. If the power switch is STANDBY, no sound will be produced from the speakers.

② POWER indicator

③ TAPE MONITOR indicator

④ EQUALIZER CONTROLS knobs/indicator

These are equalizer controls for the bands 60 Hz, 150 Hz, 400 Hz, 1 kHz, 2.4 kHz, 6 kHz and 15 kHz.

When the equalizer switch has been set to ON, these controls may be adjusted. When a control is raised upwards from the "O" position, the frequency band corresponding to that control will be emphasized; when the control is lowered, the frequency band will be attenuated. These controls can be used independently for right and left channels.

⑤ EQUALIZER Switch

When this switch is pressed, the EQUALIZER indicator lights and its functions become operative. When pressed once again, these indicators go out and the unit's functions are turned OFF. Use this switch in the following manner:

ON: When using the equalizer to add sound compensation while performing mixing operations with program sources (FM broadcasts, records, tape playback, etc.), and playing back and/or recording the results.

OFF: When not using the equalizer, but playing back or recording program sources without compensation.
In this case, the equalizer cannot be used, but tape monitor selection can be performed (when tape monitor indicator is ON, tape playback, and when OFF, source playback).

⑥ TAPE MONITOR Switch

When this switch is pressed, the TAPE MONITOR indicator lights. When pressed again, the indicator goes out. Use this switch in the following manner:

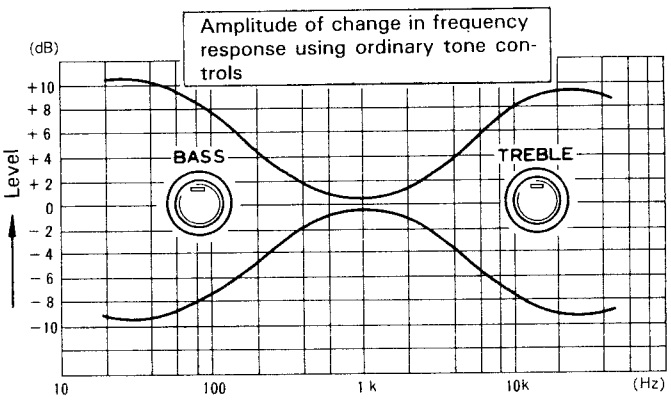
ON: When using the tape deck connected to the equalizer's tape terminals to play back with or without adding sound compensation.

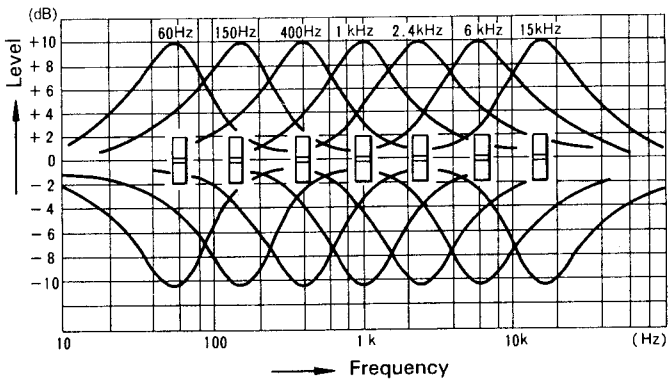
OFF: When using the components (tuner, turntable, tape deck) connected to the stereo amplifier to play back music with or without adding sound compensations.

NOTE:
In order to protect your speakers from damage resulting from excessively large inputs, whenever increasing high-frequency sounds over a wide range, be sure not to raise your amplifier's sound volume too high.

USING THE EQUALIZER CONTROLS

The graphic equalizer divides the music source into a number of frequency bands and boosts or attenuates the level at each of the frequencies, enabling much finer sound quality adjustments than ordinary tone controls and sound field compensation.
Some examples of operation are given below.

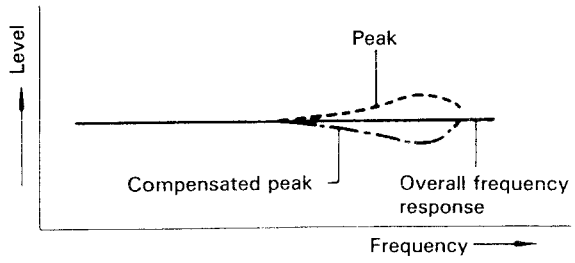




Amplitude of change in frequency response using graphic equalizer controls

1 COMPENSATING FOR THE PLAYBACK FREQUENCY RESPONSE

The frequency response of a phono-cartridge or speaker has peaks and dips in the high range and low range. It can be made flat by adjusting finely the controls on the graphic equalizer.



2 IMPROVING THE ACOUSTICS OF THE LISTENING ROOM

The ideal listening room is one where the transmission frequency response is flat. In actual fact, however, the acoustics vary depending on the effects of the structure of the room and its furniture, and on the listening position.

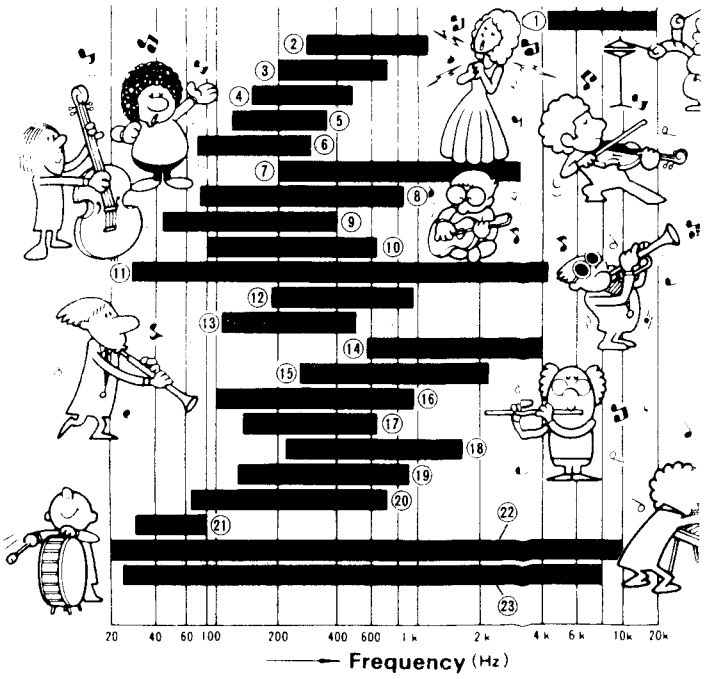
Although there is minimal treble attenuation in a listening room surrounded by hard walls and windows and having a bare floor, the bass sounds are reflected to a great extent.
In rooms like these, turn up the 150 Hz control slightly.
In a room surrounded by drapes and with carpets on the floor, there is minimal reflection of the sound and both the bass and the treble are absorbed.
In rooms like these, turn up the 60 Hz control slightly and turn up the frequency controls above 2.4 kHz gradually.
The above examples are extremely general.
The acoustics undergoes a change in accordance with the furniture in the listening room, the height of the ceiling and the listening position, among other factors.
Play the music and try operating each of the controls to produce the best effect.

3 COLORING THE REPRODUCED SOUND

All instruments and vocals have their own frequency band, as shown in the figure.
By moving the controls up or down, the volume of the instruments preferred can be boosted or other instruments can be attenuated.
For instance, it is possible to boost the 60 Hz frequency and give the bass drum a greater "punch" or boost the 1 kHz frequency and position the vocals at the front. When the 6 kHz frequency is boosted, the cymbals and "high hat" sound much clearer.
Instruments and vocals have a great many harmonic components along with the fundamental frequency band and so you can have lots of fun operating the 7 controls to achieve the sound of your choice.

NOTE:
In order to protect the speakers from damage resulting from power overload, do not excessively increase the stereo amplifier's volume level when boosting the treble range on this unit.

① Cymbals
② Soprano
③ Alto
④ Tenor
⑤ Baritone
⑥ Bass
⑦ Violin
⑧ Cello
⑨ Contrabass
⑩ Guitar
⑪ Piano
⑫ Trumpet
⑬ Trombone
⑭ Piccolo
⑮ Flute
⑯ Alto clarinet
⑰ Tenor saxphone
⑱ Oboe
⑲ English horn
⑳ Bassoon
㉑ Bass drum
㉒ Pipe organ
㉓ Electric organ



USING THE EQUALIZER CONTROLS

[4] RECORDING TECHNIQUES USING THE GRAPHIC EQUALIZER

Coloring the sound of vocals or instruments

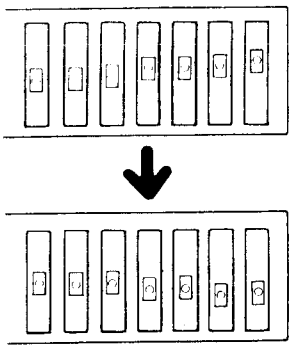
The sound of vocals and instruments can be colored at will by operating the controls. For instance, when the 400 Hz, 1 kHz and 2.4 kHz controls are raised and the other controls lowered, people's voices sound as if heard on a telephone.

Preventing howl during mixed play

Any irritating howl during play can be prevented by lowering the knob corresponding to the frequency band in which the howl occurs.

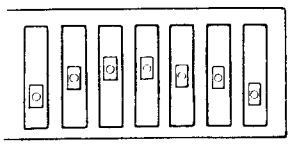
Noise can be reduced during recording and playback

When the high-range controls are boosted in step fashion during recording and then lowered in reverse fashion during playback, tape hiss and other high-range noise can be reduced.



Creating recorded tapes most compatible with the playback equipment

A sound with a greater "punch" can be recorded for playback on car stereo equipment if the ultra-low-range, which is hard to hear, is cut out and the mid-range is boosted.



OPERATIONS

WHEN PLAYING RECORDS

■ COMBINING THE EQUALIZER WITH RECORD PLAYBACK

[Refer to figure on page 4 [III]]

Perform the following operations in numerical order.

① Set amplifier's Function switch to PHONO (or INPUT SELECTOR switch to PHONO).

② Set amplifier's ADAPTOR, TAPE 2 or ADAPTOR/TAPE 2 switch (or TAPE MONITOR switch) to ON.)

③ Set TAPE MONITOR switch to OFF.

④ Set EQUALIZER switch to ON.

⑤ Play back record.

⑥ Adjust equalizer controls.

Ⓐ Turntable
Ⓑ Stereo amplifier
Ⓒ PHONO
Ⓓ Left channel speaker
Ⓔ Left (L)
Ⓕ Right (R)
Ⓖ Right channel speaker
Ⓗ ADAPTOR, TAPE 2 or ADAPTOR/TAPE 2
Ⓘ EQUALIZER INPUT
Ⓙ EQUALIZER OUTPUT
Ⓚ Adjust to desired levels.
Ⓛ Press to ON.
Ⓜ Set to OFF.

WHEN RECORDING BROADCASTS

* When connecting this unit to the TAPE 2 terminals of the amplifier, depending on the type of amplifier used, it may not be possible to make a recording via this unit.

■ USING THE EQUALIZER WHILE LISTENING TO BROADCASTS AND RECORDING THE RESULTS.

[Refer to figure on page 5 Ⓝ]

Perform the following operations in numerical order.

When tape deck 2 connected to the GR-333 is set to the recording mode, the contents of the equalizer-compensated broadcast can be recorded on cassette tape.

① Set amplifier's Function switch to TUNER (or INPUT SELECTOR switch to TUNER).

② Set amplifier's ADAPTOR, TAPE 2 or ADAPTOR/TAPE 2 switch (or TAPE 2 MONITOR switch) to ON.)

③ Set TAPE MONITOR switch to OFF.

④ Set equalizer switch to ON.

⑤ Tune in desired station.

⑥ Adjust equalizer controls.

⑦ Record results on tape.

Ⓐ Tuner
Ⓑ Tape deck 1 (double or single tape deck)
Ⓒ TAPE 1
Ⓓ REC
Ⓔ PLAY
Ⓕ Stereo amplifier
Ⓖ Left channel speaker
Ⓗ Left (L)
Ⓘ Right (R)
Ⓙ Right channel speaker
Ⓚ ADAPTOR, TAPE 2 or ADAPTOR/TAPE 2
Ⓛ EQUALIZER INPUT
Ⓜ TAPE
Ⓝ EQUALIZER OUTPUT
Ⓞ REC
Ⓟ PLAY
Ⓠ INPUT (REC)
Ⓡ OUTPUT (PLAY)
Ⓢ Tape deck 2
Ⓣ LINE
Ⓤ Adjust to desired levels.
Ⓥ Press to ON.
Ⓦ Set to OFF.

WHEN PLAYING BACK TAPES

■ COMBINING THE EQUALIZER WITH TAPE PLAYBACK

[Refer to figure on page 6 Ⓥ]

Perform the following operations in numerical order.

① Set amplifier's Function switch to TAPE 1.

② Set amplifier's ADAPTOR, TAPE 2 or ADAPTOR/TAPE 2 switch (or TAPE 2 MONITOR switch) to ON.)

③, ④ Set TAPE MONITOR switch and EQUALIZER switch.

[Tape deck 1]

③ Press to ON.
④ Set to OFF.

[Tape deck 2]

③′ Press to ON.
④′ Press to ON.

⑤ Play back tape.

⑤′ Play back tape.

⑥ Adjust equalizer controls.

Ⓐ Tape deck 1 (double or single tape deck)
Ⓑ TAPE 1
Ⓒ REC
Ⓓ PLAY
Ⓔ Stereo amplifier
Ⓕ Left channel speaker
Ⓖ Left (L)
Ⓗ Right (R)
Ⓘ Right channel speaker
Ⓙ ADAPTOR, TAPE 2 or ADAPTOR/TAPE 2
Ⓚ EQUALIZER INPUT
Ⓛ EQUALIZER OUTPUT
Ⓜ TAPE
Ⓝ REC
Ⓞ PLAY
Ⓟ INPUT (REC)
Ⓠ LINE
Ⓡ OUTPUT (PLAY)
Ⓢ Tape deck 2
Ⓣ Adjust to desired levels.
Ⓤ Tape deck 1 playback
Ⓥ Tape deck 2 playback

WHEN EDITING TAPES

■ USING THE EQUALIZER WHEN PERFORMING TAPE EDITING

[Refer to figure on page 7 Ⅵ]

Tape copying from deck 1 to deck 2 while adding compensation.

Perform the following operations in numerical order.

① Set amplifier's Function switch to TAPE 1 (or INPUT SELECTOR switch to TAPE 1).

② Set amplifier's ADAPTOR, TAPE 2 or ADAPTOR/TAPE 2 switch (or TAPE 2 MONITOR switch) to ON.

③ Set EQUALIZER switch to ON.

④ Set TAPE MONITOR switch to OFF.

⑤ Play back tape.

⑥ Adjust equalizer controls.

⑦ Set to recording mode.

Ⓐ Tape deck 1
Ⓑ TAPE 1
Ⓒ REC
Ⓓ PLAY
Ⓔ Stereo amplifier
Ⓕ Left channel speaker
Ⓖ Left (L)
Ⓗ Right (R)
Ⓘ Right channel speaker
Ⓙ ADAPTOR, TAPE 2 or ADAPTOR/TAPE 2
Ⓚ EQUALIZER INPUT
Ⓛ EQUALIZER OUTPUT
Ⓜ TAPE
Ⓝ REC
Ⓞ PLAY
Ⓟ INPUT (REC)
Ⓠ LINE
Ⓡ OUTPUT (PLAY)
Ⓢ Tape deck 2
Ⓣ Adjust to desired levels.
Ⓤ Press to ON.
Ⓥ Set to OFF.

[Refer to figure on page 8 Ⅵ]

To record from tape deck 2 to tape deck 1 while adding equalizer compensation

* Depending on the type of amplifier that is used, some of the explanations given here may not apply.

Perform the following operations in numerical order.

① Set amplifier's ADAPTOR/TAPE 2 switch (or TAPE 2 MONITOR switch) to ON.
When using the amplifier with REC SELECTOR switch:
REC SELECTOR → TAPE COPY 2 ▶ 1

② Set EQUALIZER switch to ON.

③ Set TAPE MONITOR switch to ON.

④ Play back tape.

⑤ Adjust equalizer controls.

⑥ Set to recording mode.

Ⓐ Tape deck 1
Ⓑ TAPE 1
ⒸREC
Ⓓ PLAY
Ⓔ Stereo amplifier
Ⓕ Left channel speaker
Ⓖ Left (L)
Ⓗ Right (R)
Ⓘ Right channel speaker
Ⓙ TAPE 2 or ADAPTOR/TAPE 2
Ⓚ EQUALIZER INPUT
Ⓛ EQUALIZER OUTPUT
Ⓜ TAPE
Ⓝ REC
Ⓞ PLAY
Ⓟ INPUT (REC)
Ⓠ LINE
Ⓡ OUTPUT (PLAY)
Ⓢ Tape deck 2
Ⓣ Adjust to desired levels.
Ⓤ Press to ON.
Ⓥ Press to ON.
Ⓦ In this illustration, the graphic equalizer is connected to the ADAPTOR/TAPE 2 jack of the amplifier, and the tape deck 2 is connected to the TAPE jack of the equalizer. The tape deck 1 is connected to the TAPE 1 terminal of the amplifier. With this setup, copy can be taped from tape deck 2 to tape deck 1, but make sure the function of the amplifier is set to any position except TAPE 1.

TROUBLESHOOTING

If you think the unit is malfunctioning, please perform the following checks. Often, incorrect operating procedures are to blame. The cause may also lie outside the unit itself. Check the other components and electric appliances being used at the same time. If the problem is not remedied after following the check-list below, contact your dealer or the nearest Pioneer Authorized Service Center.

SYMPTOM	CAUSE	REMEDY
No sound.	• Power switch is OFF. • Power cord is not connected. • Tape monitor switch is ON. • Incorrect operation of stereo amplifier. • Connecting cords are disconnected.	• Turn power switch on. • Plug in power cord. • Set tape monitor switch to OFF. • Check the settings of the amplifier switches (Consult the amplifiers operating instructions). • Connect the cords properly (consult page 9 for proper connecting procedures).
No graphic equalizer effects.	• Equalizer switch is set to OFF. • Stereo amplifier's tape monitor switch or the ADAPTOR/TAPE 2 switch is OFF.	• Set to ON. • Set to ON.

SPECIFICATIONS

Input terminals (reference input level/input impedance)
INPUT, TAPE PLAY ..... 150 mV/50 kΩ
Gain ..... 0 dB
Output terminals
(reference output level/output impedance)
OUTPUT ..... 150 mV/2.2 kΩ
REC OUT ..... 150 mV
Harmonic distortion (20 Hz ~ 20 kHz, output 1V)
..... 0.03%
Frequency response
INPUT, TAPE PLAY ..... 5 Hz ~ 50 kHz $^{+0}_{-3}$ dB
Equalizer bands
Center frequencies
..... 60 Hz, 150 Hz, 400 Hz, 1 kHz, 2.4 kHz, 6 kHz, 15 kHz
Variable range ..... ±10 dB
SN ratio (IHF, A network, short circuit, 1 V)
INPUT, TAPE PLAY ..... 106 dB
SN ratio (DIN)
INPUT, TAPE PLAY ..... 93 dB

Miscellaneous

Power requirements ..... a.c 220 volts ~ 50/60 Hz
Power consumption 6W
Dimensions ..... 420 (W) x 60 (H) x 221 (D) mm
Weight 2.2kg

Accessories

Pin-plug cords 2
Operating Instructions 1

Specifications and design subject to possible change without notice due to improvements.